CLEAN VERSION OF THE CLAIMS

1. 1. A positioning system comprising a signal plan, a plurality of pseudolite transmitters, a reference receiver, and a communication link;

wherein said signal plan comprises a plurality of radio frequency carrier signals;

wherein each of said carrier signals is modulated by a direct sequence spreading code in a Bipolar Phase Shift Key- (BPSK) manner;

and wherein said carrier signals and said spreading codes are chosen such that immediate carrier cycle ambiguity resolution is possible, meaning an unambiguous precise measurement of the range between two receivers, accurate to a fraction of the wavelength of the highest carrier frequency in said plan, can be derived from a single sample period of code and carrier phases, said phases being simultaneously measured by each of the two receivers;

and wherein said modulated carrier signals are further designed to provide a significant range of operation, meaning they may be utilized throughout the majority of the volume encompassed by said plurality of pseudolite transmitters;

Signal plan

B2

all systems must

and wherein said plurality of pseudolite transmitters can provide all necessary information for a user receiver to navigate in the vicinity of said pseudolite transmitters when said plurality numbers four or more;

not part of signal plan

use only ps

and wherein said plurality of pseudolite transmitters can augment a Global Navigation Satellite System so that a user receiver can navigate from incomplete GNSS information in the vicinity of said pseudolite transmitters when said plurality numbers one or more;

use GPS + PS

and wherein said reference receiver and said communication link provide differential code and carrier measurements to a user receiver.

2. (Once Amended Herein) The system of claim 1, wherein said signal plan comprises two or more frequencies in bands that can be used free from special government licensing.

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3. (Once Amended Herein) The system of claim 1, wherein said signal plan comprises two or more frequencies from the Industrial, Scientific, and Medical (ISM) bands, 902-928 MHz, 2400-2483.5 MHz, and 5725-5875 MHz.

4. (Once Amended Herein) The system of claim 1, wherein said signal plan employs GPS C/A-codes or P-codes as the BPSK spreading code.

5. (Once Amended Herein) The system of claim 1, wherein said immediate cycle ambiguity resolution property is achieved using two or more carrier frequencies and code chipping rates higher than GPS code chipping rates, that is, higher than 1.023 MHz for C/A code and higher than 10.23 MHz for P-code.

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6. (Once Amended Herein) The system of claim 1, wherein said immediate cycle ambiguity resolution property is achieved using three or more carrier signals and code chipping rates similar to GPS code chipping rates.

7. (Once Amended Herein) The system of claim 1, wherein said range-of-operation property is achieved by modulating exclusively with code sequences of sufficient length to provide the cross-correlation margin needed to operate over the desired range.

8. (Once Amended Herein) The system of claim 1, wherein said range-of-operation property is achieved by pulsing the pseudolite output signal in a TDMA manner, and thereby synchronizing the pulse timing of all pseudolites in the system such that no two pseudolite signals overlap in time.

9. (Once Amended Herein) The system of claim 1 wherein said data communication link is a radio modem.

10. (Once Amended Herein) The system of claim 1 wherein said data communication link is achieved by digitally modulating the data onto the pseudolite spreading code at a rate sufficiently lower than the code chipping rate such that both the code and data can be recovered by a user receiver.

11. (New) The system of claim 1 wherein each of said plurality of pseudolites further comprises a reference receiver, said reference receiver providing synchronization to a GNSS.

12. (New) The system of claim 1 wherein each of said plurality of pseudolites share a common oscillator, said oscillator providing system synchronization.

13. (New) A multi-frequency receiver, comprising the signal plan of claim 1, an antenna, an oscillator, a plurality of phase tracking units, a data communication link, and a processor;

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wherein said antenna may receive satellite or pseudolite signals;

and wherein each of said plurality of phase tracking units is able to track code and carrier phases of a single frequency in said signal plan for a plurality of said received satellite or pseudolite signals;

and wherein said data communication link receives code and carrier phase measurements of the same satellites or pseudolites made by a reference receiver;

and wherein said processor has a memory and an algorithm;

wherein said memory contains the locations and code numbers of all satellites and pseudolites in view, and the location of said reference receiver;

and whereby said processor collects said code and carrier phase measurements from said phase tracking units, and also collects said code and carrier phase measurements from said communication link, and executes said algorithm to generate from a single time sample of said phase measurements, a precise position solution;

wherein said precise position solution has with very high probability an accuracy of much better than a fraction of the wavelength of the highest frequency carrier in said signal plan.

14. (New) A multi-frequency pseudolite transmitter comprising the signal plan of claim 1, an oscillator, a control processor, a spread spectrum code

generator, a plurality of signal generators, a signal combiner, and a transmit antenna;

wherein each of said signal generators is comprised of a phase-locked loop circuit that derives from said oscillator one of said carrier signals of said signal plan;

and wherein said carrier signal is further modulated by a direct sequence spreading code in a Bipolar Phase Shift Key- (BPSK) manner and filtered;

and wherein each of said modulated carrier signals is combined in said signal combiner and transmitted through an antenna in conjunction with each of the other modulated carriers from said signal plan.

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15. (New) The pseudolite of claim 14, also comprising a pulse generator and an RF switch, wherein said pulse generator receives time synchronization via said oscillator and serves to time-division multiplex the transmission of said modulated carrier signals through said RF switch, such that no two signals from different pseudolites overlap in time.

16. (New) A method comprising the signal plan of claim 1, and an algorithm to convert a single time sample of multiple code and carrier phases into an unambiguous precise range measurement to an accuracy better than a fraction of the wavelength of the highest frequency carrier in said signal plan;

wherein said algorithm consists of forming a probability a density function for each code and carrier phase pair, and then superimposing all said probability density functions in order to discern the resulting unambiguous precise range measurement.